

Applicant: Laitinen, et al.
Application No.: 10/034,423
Art Unit: 3726

Claim Listing

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1. (currently amended) A method of making a roll end for a roll in a paper or board machine or in a finishing machine[[,]]:
- the roll end comprising a whole made of powdered metal having an axle journal with an end flange[[,]]:
- as well as a duct system situated inside the material of the roll end, the method comprising:
- making the roll end by a powder metallurgy process using powdered metal in a mold [[mould]] such that the duct system is formed by a pipe system placed in the mold and made out of pipe or hollow bar, the pipe system having [[has]] portions which extend radially within the end flange of the roll end and portions which extend axially within the end flange which are connected to the portions which extend radially by curved portions, the duct system end flange portions being formed in connection with the stage of making the roll end by the powder metallurgy process. ✓
2. (currently amended) The method of claim 1 further comprising the step of forming portions of the duct system out of pipe or hollow bar, which extends axially in the axle journal of the roll end in connection with the stage of making the roll end by the powder metallurgy process.
3. (original) The method of claim 1 wherein the roll end is made by a hot isostatic pressing process.

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4. (currently amended) The method of claim 1 wherein the step of forming the duct system by the powder metallurgy process further comprises:

first making a finished construction out of pipes by welding;

placing the thus made finished construction in the mold [[mould]];

filling the mold [[mould]] with a metal powder; and

carrying out the manufacture under hot isostatic pressure such that the pipe system remains in the material of the roll end, to form the duct system.

5. (original) The method of claim 1 wherein, when the duct system is made, at least one encased cavity is formed on a pipe positioned within the axle journal by a closed sleeve disposed on said at least one pipe.

6. (original) A method of claim 5 wherein the at least one cavity is left empty.

7. (original) The method of claim 5 wherein the at least one cavity is provided with a vacuum by suction.

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8. (currently amended) A method of making a roll end for a roll in a paper or board machine or in a finishing machine, the roll end comprising a whole having an axle journal with an end flange, as well as a duct system situated inside the material of the roll end, the method comprising making the roll end by a powder metallurgy process in a mold such that the duct system has portions within the end flange of the roll end, the duct system end flange portions being formed in connection with the stage of making the roll end by the powder metallurgy process; The method of claim 1

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wherein the duct system is formed of a pipe system positioned within the mold ~~[[mould]]~~ prior to filling the mold ~~[[mould]]~~ with a metal powder and applying pressure, and wherein the pipe system is coated on a pipe outside with a heat insulating coating layer before the pipe system is disposed in the mold ~~[[mould]]~~.

9. (original) The method of claim 8 wherein the coating is accomplished by flame spraying or by plasma spraying.

10. (original) The method of claim 8 wherein the heat insulating coating layer is zirconium oxide.

11. (original) The method of claim 1 wherein a high-alloy material is used as the powder metal material in the powder metallurgy process.

12. (original) The method of claim 11 wherein the high-alloy material is a gas-atomised medium-carbon tempering steel powder.

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13. (currently amended) A method of making a roll end for a roll in a paper or board machine or in a finishing machine, the roll end comprising a whole having an axle journal with an end flange, as well as a duct system situated inside the material of the roll end, the method comprising:

making the roll end by a powder metallurgy process by placing steel powder in a mold such that the duct system has portions within the end flange of the roll end, the duct system end flange portions being formed in connection with the stage of making the roll end by the powder metallurgy process; ~~The method of claim 1~~

wherein, in the axle journal of the roll end, a powder material that conducts heat more poorly than steel, is used at a desired depth in ~~[[the]]~~ a region intended to be under a bearing.

14. (original) The method of claim 13 wherein the powder material that conducts heat more poorly than steel is a metal matrix composite.

15. (original) The method of claim 1 wherein the duct system is formed by a pipe system made out of seamless pipe or hollow bar.

16. (original) The method of claim 15 wherein the seamless pipe or hollow bar is formed of austenitic stainless steel.

17. (currently amended) ~~[[A]]~~ The method of claim 1 wherein the method includes the steps of forming a roll end blank in the powder metallurgy process, dismantling, breaking or machining off the mold ~~[[mould]]~~ from the blank, and machining the blank into a desired shape and dimensions.

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18. (currently amended) A method of making a roll end for a heatable roll in a paper or board machine or in a finishing machine, which roll end comprises a whole formed by an end flange and an axle journal, as well as a duct system which is situated inside the material of the roll end and through which in the finished roll end a heat transfer medium intended for heating the roll is arranged to circulate from outside the roll through the axle journal and the roll end into bores of a roll shell and back, wherein the roll end is made by a powder metallurgy process in a mold [[mould]] such that at least a duct system is formed by a pipe system made out of pipe or hollow bar, the pipe system being intended for the heat transfer medium, and the pipe system being placed in the mold and having portions [placed in the] which extend axially within the end flange which are connected to portions which extend radially by curved portions, and wherein said end flange of the roll end is formed in connection with the stage of making the roll end by the powder metallurgy process. ✓

19-26. (cancelled)

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27. (currently amended) A method of making a roll end for a heatable roll in a paper or board machine or in a finishing machine, comprising the steps of:

placing a duct system comprised of a plurality of connected pipes within a mold [[mould]];

filling the mold [[mould]] around the duct system with a metal powder;

applying heat and pressure to the metal powder within the mold [[mould]] to form the metal powder into a desired shape; and

removing the mold [[mould]] from the roll end, in which the duct system comprises at least one duct extending through an axle journal of said roll end, and at least one duct connected to the axle journal duct which extends by curved portions of the duct to portions which extend axially within and through an end flange of the roll end, the duct system being intended for conveyance of a heat transfer medium from exterior the roll end into the roll end. ✓

28-33. (cancelled)